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THE COLLECTION AND HANDLING OF AIR-RAID CASUALTIES.

THE collection and handling of air-raid casualties is a problem to which the British have recently been giving increasing attention. The following article is based very largely on English experience, as recorded in various medical journals and other communications reaching Australia.

FIRST-AID WORK AT THE SITE OF AN INCIDENT.

When an air-raid warden becomes aware of a bombing "incident" he should make a report to his control centre, telling of the site of the incident and of the estimated number of casualties. As this report is the basis on which first-aid services are supplied, it is well to remember that in practice the early messages are sometimes incorrect, often duplicated and usually incomplete. At the control centre is the chief warden for the municipality or shire. On receipt of the warden's message, he should arrange for the dispatch of a stretcher party, consisting of a qualified doctor as medical commandant and four or more trained first-aid workers, together with a driver-clerk and the necessary equipment.

This stretcher party is the medium through which the first skilled medical attention is given to air-raid victims. Its immediate problem is to make contact with the patients. These do not present themselves; they are often buried in debris, and the rescue work concerned with digging them out cannot be dissociated from first-aid attention. It is, in fact, the first of the first-aid measures, and in some respects the most important. The medical man, the rescue man, the digger, the stretcher bearer, the fireman and the policeman are all one team, and lives may be lost through inefficiency on the part of any of them.

Inasmuch as the removal of debris may involve difficult engineering problems, a specially trained rescue and demolition squad should be provided by the control centre to superintend this work. Adequate numbers of these rescue gangs have been found to be essential, and the saving of life is largely dependent on their efficiency. The rescue work is carried out on the assumption that people, though buried, are alive; and therefore, as one gang of workmen becomes tired, another takes over, so that the process is continuous. People have been rescued and revived after being buried for four days.

It is essential for the rescuers to know something of first aid; otherwise they cannot handle the victims with confidence and efficiency. Progress is often slow; the shaft that is sunk has to be narrow in order to be stable, and it may not be possible to use tools such as picks and shovels. Bits of debris may have to be laboriously pulled out by hand, and the victims gradually uncovered. Rescue parties require lights; and stretchers, adapted to move casualties even in a vertical direction from damaged buildings, are essential.

One special type of rescue work is the recovery of patients trapped in a burning building. Trained firemen are best able to handle this work, but all first-aid personnel

should realize that quick removal of the patient is necessary if he has collapsed from asphyxia. The rescuer can partly protect himself by applying a respirator or by tying a handkerchief soaked in water over his nose and mouth. He takes several deep breaths before entering the building, and, while rescuing the victim, keeps as close to the floor as possible.

The first-aid treatment at the site of the incident should not be overdone. This advice is all the easier to follow during night raids, when lighting has to be restricted. Non-urgent treatment, such as the administration of anti-tetanus serum and the application of elaborate dressings, is therefore deferred. The following six measures constitute the maximum, and not the usual, amount that can be done: (a) arrest of hæmorrhage; (b) initial treatment of shock; (c) temporary immobilization of fractures; (d) dressing of wounds; (e) rescue of those suffering from electric shock; (f) general care of those being recovered by the rescue squad.

Arrest of Hæmorrhage.

Patients with hæmorrhage are looked for and treated first. A pad, improvised or otherwise, is pressed into the wound and held firmly until a dressing and bandage can be applied. If an artery is bleeding, pressure is made on the appropriate "pressure point" until the dressing is in place.

Tourniquets are rarely, if ever, needed. A serious criticism of first-aid work in England is that the tourniquet has been used excessively.⁽⁶⁾ In very few cases of primary hæmorrhage, in which a tourniquet applied early could save life, does the patient actually live long enough to be treated; and, in most cases of hæmorrhage, a straightforward dressing and bandage are usually sufficient to stop the bleeding. Moreover, the correct application of a tourniquet is not easy, especially if it has to be done quickly. When efficiently applied, it is very painful and involves a risk of infection, of gangrene and of damage to nerves, and may produce acute symptoms of shock when released. If inefficiently applied, it prevents venous return without affecting the arterial supply, and so increases the loss of blood.

In those rare cases in which a tourniquet is found necessary, the time of application and a letter "T" should be marked on the forehead. The tourniquet is then relaxed every fifteen minutes.

Initial Treatment of Shock.

The most important measure is the administration of morphine. The dose is larger than has been customarily given in civil practice, the guiding principle being that pain must be relieved. An initial dose of half a grain is very often necessary. The amount given is printed on the forehead together with the letter "M".

Relief of pain can also be assisted by efficient dressings and by immobilization of wounded parts. Further treatment of shock is to keep the patient warm, and this is done with the blankets and hot water bottles which should be part of the equipment of every first-aid party. The patient is also rested in as sheltered a place as possible.

Temporary Immobilization of Fractures.

Fractured Jaw.—The aim of first aid in fracture of the jaw is to apply a bandage so as to pull the mandible in an upward and forward direction. This is accomplished by using the barrel bandage. Six feet of two-inch unbleached calico are required. The middle of the bandage is placed under the jaw just in front of the angle of the mandible. A simple double knot is tied over the vertex of the skull. This knot is then opened with both hands so that the front loop lies in front of the forehead and the back loop under the occiput. The bandage is adjusted smoothly, and the two ends are tied in a reef knot on the top of the head.

In some cases of fractured jaw the tongue falls back and obstructs breathing. These patients should be carried face downwards.

Fractured Spine.—To assist in lifting the patient with a fractured spine, a figure-of-eight bandage is tied around the feet and ankles and a broad bandage around the knees. Lifting must be done without bending or twisting the spine. The patient should be carried face down on a rigid stretcher, except when the fracture is cervical. In this case he is laid on his back with a support under his shoulders and one on each side of his head.

Fractured Clavicle.—In fracture of the clavicle the shoulder should be braced upwards and backwards by a figure-of-eight bandage which passes across the axilla on one side and over the upper part of the back to the anterior aspect of the opposite axilla. The arm on the injured side is put in a "collar and cuff" sling.

Fractured Humerus.—In fracture of the humerus wooden or Gooch splints are applied to the sides of the arm, a pad is placed in the axilla, and the arm is bound to the trunk. A small arm sling is used for the forearm on the injured side.

Fractured Elbow and Forearm.—In fracture of the elbow and humerus wooden splints are applied on dorsal and volar aspects, an angled type extending up to at least the mid-shaft of the humerus being used in the case of the elbow injury. The arm is then placed in a large arm sling.

Crushed Hand.—The wound of a crushed hand is dressed and the arm placed in a large sling, which is then pinned to the shirt.

Fractured Ribs.—Where the fracture of a rib is simple, no urgent local treatment is required, but if the bony fragments are pointing into the chest, movement on the affected side has to be reduced. The patient is turned slightly towards the injured side and the corresponding arm is bound to the body.

Fractured Pelvis.—The patient with a fractured pelvis is allowed to assume the position of greatest ease. Broad bandages are tied round the pelvis and knees, and a figure-of-eight bandage around the ankles.

Fractures of the Lower Limb Excluding the Ankle and Patella.—The mainstay for treating fractures of the lower limb, excluding the ankle and patella, is the Thomas knee splint, which should be available in a range of sizes. It is applied without removing the clothes. The fracture site is supported by Gooch splinting, and the Thomas splint is then slipped over the limb and pushed up against the ischial tuberosity. A half-hitch of bandage is placed round the ankle, and extension is gained by tying the ends to the W of the splint. A stirrup is sometimes attached to the splint as an easy way of preventing the foot from falling to one or other side. The whole splint has then to be tied to some fixture on the stretcher.

In the absence of all splints it is surprising how much comfort can be obtained by tying the two legs together. The limbs are placed side by side in as natural a position as possible. Hollows are padded and the limbs bound by a figure-of-eight bandage at the feet, and broad bandages at the knees, the fracture site and either the thigh or the leg according to the position of the fracture.

Fractured Ankle.—In fracture of the ankle a figure-of-eight bandage is put around the injured ankle. The two legs are then bound together by a broad fold bandage at the knees and a figure-of-eight bandage at the ankles.

Fractured Patella.—In fracture of the patella a figure-of-eight bandage is placed round the injured knee and left untied. The two legs are then bound together at the ankles and thighs. Then the figure-of-eight bandage on the injured knee is tied, and an enveloping bandage placed round both knees.

Dressing of Wounds.

Only a simple sterile dressing is applied to wounds. A patient with an abdominal wound is put in the Fowler position at once if possible and kept there, so as to limit the spread of infective material. Protruding intestines should be covered with a dressing and left *in situ*. In cases of suspected abdominal injury morphine should be given only when pain and restlessness are present. Patients with injury to the lung should be carried in a sitting position, when possible.

There is one exception to this simple treatment of wounds. Large, open chest wounds should be closed as an urgent first-aid measure. The open wound should be covered by a voluminous dressing, or closed by a few deep wide sutures, and the patient taken to hospital as early as possible.

Rescue of Those Suffering from Electric Shock.

In the rescue of persons suffering from electric shock, the current, if possible, is turned off; otherwise the rescuer has to insulate himself while he moves the victim. He therefore dons surgical rubber gloves or uses an improvised protector such as a rubber tobacco pouch; failing this, he can push the victim off the wire with a stick, or pull him off by the coat tail if the clothes are dry. For additional precaution the rescuer stands on dry board or thick newspaper.

Quick resuscitation of those shocked by electricity is very important. When artificial respiration is commenced within one minute of the accident, 90% recover; if there is a delay of six minutes, only 10% recover. In either case success is rarely apparent in less than an hour.

General Care of Those being Recovered by the Rescue Squad.

Many cases arise in which a trapped and fully conscious victim has no prospect of being released under a few hours. Usually, he needs morphine; if possible, he should have fluid, and rescue parties should carry feeding bowls with rubber tubing attached to the nozzle so that drinks can be given under otherwise difficult conditions. Perhaps the most important obligation towards these victims, however, is to encourage them; the mere presence of a doctor helps considerably in doing this.

It must be emphasized again that none of the first-aid treatment should unduly lengthen the time taken to admit the seriously injured patient to hospital. The best that can be done for him is to take him quickly to a place where full surgical treatment is available.

The first-aid treatment at the incident is carried out by trained men working under the medical commandant. English experience is definite regarding the importance of the doctor, and if each stretcher party cannot have its own medical officer, an "incident doctor" should be sent from amongst the local private practitioners. The duties of the doctor at the incident are as follows:

1. He classifies the casualties. Some have minor injuries, some are severely injured, and some are dead. The doctor lessens the strain on the hospitals by referring minor injuries to the first-aid post. He supplements this by sending the genuinely serious casualties direct to the hospital. Again, there are instances in which it is doubtful whether a man, partly buried in debris, is dead or not. The doctor can help the rescuers considerably by giving an opinion on the matter.

2. He administers any morphine required. Cases have been known in England in which patients have been brought to hospital screaming with pain that should have been relieved by morphine.

3. He supervises first-aid treatment.

4. His presence helps the morale of both victims and rescuers.

When the pressure of work at an incident is not great, the doctor may satisfy himself that a certain number of patients have no injuries of consequence. These can be reassured and sent to their home, if they have a home remaining, or to a rest centre related to the aid post. Further treatment is given to those requiring it, either at the nearest first-aid post or at the hospital.

THE WORK AND ORGANIZATION OF A FIRST-AID POST.

The functions of a first-aid post are: (a) to treat the lightly wounded; (b) to decontaminate minor gas casualties; (c) in certain areas to care for those waiting transport to hospital and those too severely wounded to stand a journey to hospital. Circumstances, such as the proximity of the incident, may direct these serious casualties to a first-aid post, but in general they are not a proper responsibility for it to undertake.

The patients handled by an aid post will consist of those who go of their own accord, those minor casualties who have been sent by a stretcher party from an incident, and casualties, both serious and trivial, from any nearby incident.

The most important work is the care of the so-called "walking wounded". The thing which the first-aid post must not do is to obstruct the passage of the serious cases to hospital. It is not the equivalent of the advanced dressing station of the 1914-1918 war. Such dressing stations had to handle all casualties; the first-aid post should deal chiefly with those whom it can treat completely. The term "first-aid post" is, therefore, partly a misnomer, since in the main the post should provide, not the preliminary treatment for all, but the final treatment for some.

The personnel required at a first-aid post consists of medical officer, supervisor, deputy supervisors, quartermaster, dressers, clerks and canteen workers.

The medical officer organizes and trains the staff. He should give regular courses of instruction and supervise practice exercises. When the casualties arrive after a raid, he sees at least the patients whose treatment is more difficult, and does such minor surgery as the equipment and circumstances permit. Two sets of instruments should be provided for him, so that one can be sterilized while the other is in use. It is a good idea to set aside, in the care of one person, a tray containing all the requirements for hypodermic injections, especially morphine and anti-tetanus serum. As the medical officer prescribes these, he may give them at once or they can be given by a trained nurse, and are not forgotten in the turmoil. If careful medical work is to be done, the lighting has to be good, and the blackout protection of the post should therefore be adequate.

The supervisor and deputy supervisors are trained nurses, and are responsible for the general administration in the absence of the medical officer. During a raid the medical officer is too busy attending to patients to exercise command over the post, so that the supervisor controls the whole organization. The deputy supervisors each look after a section of the first-aid work. They have to resist the temptation to do the dressings themselves, since they cannot usually be spared for this.

The dressers are trained in first aid. This should mean that they have had experience in the casualty department of a general hospital. To learn from air raids only is too slow and too costly for the victims.

The canteen workers have an important job to do. Practically all the patients are afraid, to some extent, and in about 20% of cases this is the major therapeutic problem. These people are comforted and reassured if they can sit down quietly and have tea, coffee, milk, "Bovril", cigarettes or, in the case of children, hard candy, especially if the refreshments are dispensed cheerfully.

One clerk should be attached to the quartermaster to look after the store of blankets and stretchers, which are exchanged for those used in bringing casualties to the post.

The workers at a first-aid post should include an efficient messenger service. The post is likely to be a rallying point for the district, and apart from its own business, it receives

all sorts of information which should properly go to the warden or the control centre. Therefore, emergency communications should be kept open with such centres. This means that the post should be in contact with the local warden, the control centre and the hospital and ambulance control.

The successful running of an aid post requires careful preparation and constant practice. There should be a coordinated plan, for example, regarding alternative method of heating and lighting, and the quartermaster should foresee the possibility of bombs destroying the equipment. Moreover, a post which has been closed for weeks cannot open efficiently at an hour's notice; and so frequent rehearsals are necessary. Even so, many problems arise that can be solved only by the ingenuity of those on the spot. In general, however, the medical work at any post is likely to centre around the following activities and conditions.

Resuscitation.

Most of the patients have primary shock; perhaps 10% if left untreated would develop secondary shock. Prophylactic measures are therefore taken against this. Those in pain are relieved by attention to their injury and by the giving of morphine. All the injured are kept warm by means of blankets, hot water bottles and lamps, and are given hot sweetened drinks.

Cleansing.

The patients on admission are often filthy from brick dust, grime, soot and blood. For the sake of morale and for the proper examination of wounds, these people have to be washed thoroughly, whenever the condition of their injuries permits it. Ordinary soap is not very effective, because the dirt has often been blasted into the skin and is very tenacious. The washing is done with large quantities of hot water and liquid spirit soap, applied with pieces of old towelling. A blanket bath is sometimes required. Much time is spent in certain cases in washing scalps free of glass. The eyes may need gentle irrigation from an undine.

Lacerated Wounds, Abrasions and Contusions.

Lacerated wounds, abrasions and contusions are a common type of injury. When simple, they are washed, sutured if necessary, and dressed. An injection of anti-tetanus serum is given. There is a danger that more serious wounds may be overlooked, and this applies particularly in the case of head injuries. Hair must be thoroughly shaved or cut away so that proper examination of scalp wounds is possible.

In the case of large wounds, the bleeding is stopped and the patient sent on to hospital. Gross hemorrhage is uncommon. It is controlled either by applying a pad and bandage or by tying off the vessels, if they are easily found.

In the treatment of all wounds, including burns, care should be taken not to establish infection. There is abundant evidence that fresh air-raid wounds are only rarely contaminated by pathogenic bacteria.⁽¹⁰⁾ Such bacteria are implanted during treatment and come mainly from the noses and throats of the attendants and onlookers. It is, therefore, an obligation on all those who treat wounds to wear a mask as long as the wound remains exposed.

Burns and Scalds.

Burns and scalds may be major or minor. A major burn is one which is more than about four inches in diameter, or which, though smaller, is of third degree. No major burn can be properly treated in a first-aid post and the patient must be sent to hospital. Morphine and warm drinks are given and the patient is kept warm. No attempt is made to clean the burn. A simple dressing is applied, consisting of lint soaked in normal saline solution or a 2% solution of sodium bicarbonate, or even of dry lint. The whole is covered with a bandage. The patient is handled gently and given priority of transport to hospital. As in the case of other wounds, it is essential that the attending personnel should wear masks.

Minor burns can be treated at the first-aid post. They are first cleansed with plenty of soap and water. The

cleansing should be careful and deliberate. Burns of the face, hands or genitals are then dressed with sterile "Vaseline" gauze or *tulle gras*. Those in other parts of the body may be treated similarly; they can also be tanned, if precautions are taken about thorough cleansing, so that the risk of infection is small. The tanning is done with tannic acid, 1% gentian violet jelly or triple dye. No dressing is applied, and the area is not allowed to come into contact with the clothes until the coagulum has formed. If the burn is too slight to warrant the time necessary for tanning, a picric acid dressing may be used.

Eye Injuries.

Eye injuries may occur in association with other wounds, but when the eye injury is the chief or the only lesion, the casualty is classified as walking wounded and often goes to the first-aid post. The commonest types of eye injury seen in air raids are: (a) lacerations of the lids, often due to glass; (b) foreign bodies in the eye; (c) burns; and (d) blast effects, which resemble the results of a blow from a blunt object. Practically none of these injuries should be finally treated at a first-aid post; they are amongst the most serious that the walking wounded can have.

Lacerations of the lids are cleansed and covered with a pad soaked in some non-irritating antiseptic such as 0.1% proflavine solution. If there is hemorrhage, it is easily controlled by pressure on the pad against the underlying bone. Any suturing should be done in hospital.

The removal of foreign bodies from the cornea is not a first-aid measure. Temporary relief can be given by instilling a drop or two of bland oil such as castor oil into the conjunctival sac, and then covering with a pad and bandage. Cocaine instillation is to be deprecated, as it dries and devitalizes the cornea. Often in air-raid injuries the foreign body is deeply penetrating. This type of lesion must be regarded seriously. Any first-aid attempt at removal may lead to disastrous loss of vitreous. Patients with penetrating eye injuries must be kept lying down during transport to the hospital.

Burns may be due to heat alone or to hot foreign bodies. A common example of the former is the case of the fireman who has had hot smoke in his eyes; he may be temporarily blinded by it, but he responds well to the washing out of the conjunctival sacs with saline solution, and the instillation of paraffin drops. In the latter case the patient is given only first-aid treatment in the form of irrigation with saline solution. The pain in any eye injury may be so severe that it is necessary to apply an anæsthetic ointment such as 2% butyn ophthalmic ointment, which should be available at all first-aid posts.

If blast injuries of the eye are suspected, expert treatment is essential and the prognosis should be guarded. Rupture of the globe is obvious, but there may be few indications of such serious underlying lesions as detachment of the retina, rupture of the choroid, dislocation of the lens or iridodialysis.

Fractures.

All fractures are carefully immobilized if that has not already been done, and general treatment is given. If the fracture is simple, the patient is told to report to hospital next day; if it is compound, he is sent on to the hospital at once. The aid post requires a store of Thomas splints and the dressers should be well drilled in the proper application of them.

Acute Emotional Shock.

Acute emotional shock is a very common and important air-raid injury, caused by horrifying sights or terror of bombardment. Treatment at the aid post is not only possible but also highly desirable, since the earlier these patients are treated the better.

The immediate treatment of patients with acute emotional shock is reassurance and re-establishment of self-confidence. This requires firm but sympathetic handling. The patient is made to see that his symptoms are due to terror and that this is a normal reaction, though it should,

and can, be controlled. Such terms as "shell-shock" or "bomb-happy", which may suggest that these nervous symptoms have a physical basis, must be rigidly avoided. The medical measures used are rest in a quiet place, warmth, hot drinks with sugar, and a sedative such as twenty grains of bromide, or one grain of phenobarbitone, or even occasionally a quarter of a grain of morphine. These patients should be segregated from those who are suffering from trauma.

It is interesting to note that, apart from these cases of acute emotional shock, very few psychiatric casualties are seen at the first-aid post. It is not the great dangers of life shared in common that help to produce mental illness, but the private and sometimes petty distresses of everyday life.

Gas Decontamination.

It is proposed that the first-aid posts should be used for decontamination in cases of vesicant gas poisoning, provided the patients have no other wounds. If they are wounded as well they should be decontaminated at the hospital.

It must be understood that decontamination from poison gas is undertaken only in the case of the vesicants, of which the most important are mustard gas and lewisite.

Evacuation.

The final responsibility of the aid post is to dispose satisfactorily of its patients. Some can be sent to their own home or to the home of friends; some are taken to hospital, either at once or after a varying period of treatment. Occasionally patients die at the aid post, in which case they must be removed to the mortuary as soon as possible. An ambulance should be at the disposal of the aid post.

The Reception of Air-Raid Casualties at the Hospital.

An average time taken for transport to hospital is one hour.⁽¹⁾ Once the casualties begin to pour in, there is a period of about half an hour during which the majority arrive. This raises the question of the capacity of the hospital to receive them.

The capacity of a hospital is determined by its operating facilities rather than by the number of its beds. Experienced surgeons agree that the golden period for operation on fresh wounds is the first eight hours. Any delay beyond this is a serious matter and causes unnecessary loss of life. It is suggested that operations can be done at an average rate of one per hour.⁽²⁾ Therefore, if no patient is to wait more than eight hours, a four-theatre hospital with four operating teams can cope with about twenty-eight operations from one series of admissions. This means that such a hospital could admit forty to fifty patients from one raid. It is therefore seen that many hospitals with large bed space but poor operating facilities will give surprisingly low estimates for the number of major casualties with which they can deal.

It is obvious at the outset that the ordinary hospital routine for admitting patients will not be adequate. A hospital which customarily receives five to twenty patients a day, many of them not requiring immediate attention, may find itself admitting fifty to one hundred patients in two hours. The collection and early handling of air-raid casualties, therefore, has to be supplemented by far-reaching hospital organization.

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